the improvement of the drug products by cultural conditions. Approximately 190 species are now cultivated in the United States while 178 species are growing wild, and in addition to this number probably 50 or 75 species from Europe and other countries might be profitably cultivated.

Part II. — Pharmacognosy — dealing with crude drugs and powdered drugs and food, consists of extended and greatly improved presentations of the same subjects as in the older edition. The attention attracted to this part of the work and especially the elaboration of keys for the identification of the crude and powdered drugs has already been noticed in TORREYA. It need only be added that the treatment has been greatly improved by the addition of numerous illustrations, and, in the chapter on drugs and foods, drawings and descriptions of the histological elements and contents of over 200 foods, spices, and drugs are given.

The work closes with a chapter on the various classes of reagents and on the technique involved in sectioning and mounting of specimens. CARLTON C. CURTIS.

Cook's Aspects of Kinetic Evolution*

The method by which the present order of things in the universe has been brought about is a problem whose solution has challenged the philosophically inclined from the time of the early Greeks and earlier to the present day. Among the various hypotheses that have been proposed may be mentioned the following:

I. *Special creation.* God made things; *i. e.*, we do not know how the present order came about. The question is not a proper one for scientific inquiry. (Cuvier, Agassiz.)

II. *Evolution.* The present order came about as the result of a series of gradual changes. The changes by which the present order of living things resulted constitute organic evolution. Theories of organic evolution have been either *static*, regarding the organism as changing only when acted upon from without; or *kinetic*, regarding the organism as changing spontaneously.

* Cook, O. F. Aspects of Kinetic Evolution. Proc. Wash. Acad. Sci. 8 : 197–403. 1907. Washington, D. C. Published by the Academy.

The theories may be grouped as pre-Darwinian, Darwinian and post-Darwinian.

(*a*) Pre-Darwinian. (Chiefly static.)

1. The environment (many of the factors of which are known) directly causes organisms to change. (Lamarck, de Maillet, Nägeli, and others.)

2. The inheritance of the effects of use and disuse is a causal factor in the change. (Lamarck, Spencer.)

(*b*) Darwinian. (Partly static.)

The changes of variation (however caused) are of the kind known as continuous. Certain of these changes are perpetuated by natural, *i. e.*, environmental, selection. The fittest only survive. (Darwin, Wallace.) There have been several modifications of Darwinism as originally proposed by Darwin. Darwin, and especially Huxley, recognized the fact that variations might be spontaneous (kinetic).

(*c*) Post-Darwinian.

1. The variations of evolutionary significance are spontaneous (kinetic), and discontinuous (mutations). One method of evolutionary advance is by the operation of natural selection on mutations. Hybridization is also a factor. (De Vries.)

2. The variations involved in evolution are continuous and spontaneous (kinetic), resulting entirely from interbreeding (*symbasis*). Natural selection is not a factor in evolution. (O. F. Cook.)

This last hypothesis is most fully elaborated in "Aspects of Kinetic Evolution." According to the author, "The kinetic theory of evolution finds in the facts of organic development indications that the characters of species change spontaneously, or without environmental causation (p. 197), and holds "that evolution arises from the association of organisms into interbreeding groups, or species" (p. 290).

Evolution, "the process of change by which the members of an organic group become different from their predecessors, or from other groups of common origin" (p. 277), differs from speciation, or "the attainment of differential characters by segregated groups of organisms, that is, by subdivision of older species (p.

278). "Symbasis is the normal evolutionary condition of free and extended interbreeding among the individual members of natural species" (p. 277).

The above quotations indicate what, in the mind of the author of the hypothesis, is the essential difference between this hypothesis and its predecessors. The reader is "duly warned" (p. 295) that "kinetic evolution does not come as an amendment to natural selection," for "selection is not merely inadequate as the cause of evolution; it is not an evolutionary cause at all, in the concrete physiological sense."

In harmony with the theory, it is most important to distinguish:

Heterism — "the diversity of individuals inside the species" (p. 318).

Evolution — the process of change of type through the assemblage of variations by inbreeding (*symbasis*). Symbasis may not cause variation (p. 318), but it is the cause, *par excellence*, of evolution.

Speciation — "The attainment of differential characters by segregated groups of organisms" (p. 278). "Evolution depends upon symbasis, speciation upon isolation" (p. 278).

Incidentally, in this connection, it seems pertinent to inquire how, since there is no "law of heredity," * can variations be assembled, since they would not be transmitted from parent to offspring.

The mere proposal of a theory of evolution, purporting to be diametrically opposed to all preceding theories, and whose acceptance implies the total rejection of the latter as not only inadequate but misleading and fundamentally false, is not only a bold claim, but it at once challenges the closest examination and comparison and the most rigid criticism.

In a careful reading of the book, one is impressed with the conspicuous absence (with few exceptions) of definite citations in referring to the literature dealing with other theories, and of an entire disregard, in some instances, of other work that has a direct bearing upon the theory proposed as new. For example,

* Cook, O. F., & Swingle, W. T. Evolution of Cellular Structures. Bull. Bureau Plant Industry, 81: 9. 1905.

in denying (p. 222) "any directly causal connection between evolution and environment," there seems to be no recognition of the fact that environment may operate directly upon the germ-cells and cause variations, which, as MacDougal has experimentally shown, are undoubtedly inherited. Again, in discussing "Differences in Growth-stages" (p. 237), no mention is made of Diels' recent and very pertinent work on "*Jungendformen und Blütenreife im Pflanzenreich.*" Also no reference is made to Blaringhem's work on the inheritance of the effect of injuries, which surely has a bearing on environment as a causal factor.

One wonders if "Diversity of Normal Descent (Heterism)" p. 244, *et seq.*) is offered as an original idea. Such seems clearly to be the implication, and yet memory persists in recalling Bailey's "The Survival of the Unlike," * and his "Cross-breeding and Hybridizing" (p. 5), to which no reference is made, and the older "Bathmism" of Cope, and, to go still further back, the clear statement of the idea by Herbert Spencer.†

Here and there throughout the book the term "evolution" seems to be used as synonymous with "organic evolution"; *e. g.*, "Evolution is a name for the process of gradual change by which the diversity of organic nature has come about" (p. 284). So, also, on page 277, quoted above. Furthermore, there seems to be a redefinition of old terms, and then the employment of these terms as newly defined when discussing Cookism, but as previously defined when referring to other theories. For example, on page 314, isolation, considered a factor in (organic) evolution (old definition), is rejected as a factor in evolution (new definition, *i. e.*, variation through symbasis). From this the *non sequiter* is inferred that the theories are wide apart.

In referring to de Vries's theory of mutation, it is stated that "Professor de Vries argues, in some of his writings, that mutations are due to environmental causes," yet no reference is made to the following statement of de Vries: "The variability of species is independent of environment. In my experiments the mother species mutates in all directions. . . . The mutation

* See, *e. g.*, pp. 20, 25, and 53 of that work.

† Principles of Biology 2: 329. 1900.

therefore is independent of environment, its direction is not governed by circumstances." * Or, in "Species and Varieties" (p. 696), "the ordinary external conditions do not necessarily have an influence on specific evolution."

If the statement (p. 322) that, "The evolution is in the species, the power of deflection in the environment," by contrast with the quotation on the same page from de Vries that "By this means natural selection" (said, in the same paragraph, to be "not a force of nature, no direct cause of improvement") "is the one directing cause of the broad lines of evolution," is meant to point out a difference in the two theories, the close propinquity of the two sentences seems quite unfortunate.

Possibly, also, the statement that, according to de Vries, new characters, in order to be preserved, must be environmentally useful (p. 281), would not have been written if notice had been taken of de Vries's declaration that, "Harmless or even slightly useless ones (mutations) have been seen to maintain themselves in the field during the seventeen years of my research . . . ." And on page 281, the cart and horse are surely reversed, when it is stated that, according to de Vries, "new species have to be made, in order to originate and preserve new characters."

If evolution, "represents the working of no special . . . . mechanism" (p. 323), it is difficult to understand how "The final and ultimate explanation of evolution must await an understanding of the constitution of living matter" (p. 323), or what the positions of "granules derived from a given ancestor" have to do with evolution. We cannot escape mechanisms by writing atoms and molecules, or granules, instead of chromosomes.

De Vries is said (p. 362) to "especially insist" on the tenet that the idea of species is "founded on identity of form and structure," and is quoted six lines below as saying that "purely uniform species seem to be relatively rare." If the term species is used in each of these cases with the same meaning, the discrepancy between the interpretation and the quotation is quite evident, and even more so when we recall de Vries's statements in "Species and Varieties," that, in species, "All sorts of variability occur, and no individual or small group of specimens can really be considered

* De Vries, Hugo. Science, II. 15 : 727. 1902.

as a reliable representative of the supposed type" (p. 37). "We may conclude that systematic species, as they are accepted nowadays, are as a rule compound groups" (p. 38). These quotations can hardly be interpreted as an insistence upon the dictionary definition of a systematic species.

Anyone who holds that the term species cannot be given a definition acceptable to all systematists has returned to a "mediaeval" type of reasoning (p. 362), and taxonomists may now choose from arropic, ropic, subsexual, semisexual, sexual, supersexual, symbasic, porric, stenic, linic, and clonic species (p. 389 *et seq.*).

Typographical errors are rare, but on p. 234 it seems that "*intra*spective" should be read "*intra*specific."

The lack of qualitative variations in such species as, *e. g.*, *Liriodendron Tulipifera*, or in species of the diatoms, which have persisted unchanged through many geological epochs, and the coexistence of closely related species without isolation, environmental or physiological, are some of the problems which seem more difficult of solution on the basis of "kinetic evolution" than otherwise.

Emphasis upon the idea of kinetic variation in organic evolution is a distinct service, and the idea is of increasing interest in the light of the recent revelations of physical chemistry, pointing strongly to the evolution of the chemical elements by spontaneous transformations, that is, by a kinetic inorganic evolution. The volume, however, does not refer to this closely related phenomenon, and kinesis is discussed only with reference to the realm of the organic.

C. Stuart Gager.

PROCEEDINGS OF THE CLUB

May 29, 1907.

The Club met at the museum building of the New York Botanical Garden at 3:30 o'clock, with an attendance of twenty.

Dr. John Hendley Barnhart was called to the chair.

After the reading and approval of the minutes of the meeting of May 14th, the following scientific program was presented: